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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/803,910	03/19/2004	Seiichi Higaki	ASAM.0115	6368
7590 REED SMITH LLP Suite 1400 3110 Fairview Falls Church, VA 22042			EXAMINER PATEL, KAUSHIKKUMAR M	
			ART UNIT	PAPER NUMBER
			2188	
SHORTENED STATUTORY PERIOD OF RESPONSE		MAIL DATE	DELIVERY MODE	
3 MONTHS		12/27/2006	PAPER	

**Please find below and/or attached an Office communication concerning this application or proceeding.**

If NO period for reply is specified above, the maximum statutory period will apply and will expire 6 MONTHS from the mailing date of this communication.

<b>Office Action Summary</b>	<b>Application No.</b>		<b>Applicant(s)</b>	
	10/803,910		HIGAKI ET AL.	
	<b>Examiner</b>		<b>Art Unit</b>	
	Kaushikkumar Patel		2188	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 12 October 2006.
- 2a) ☐ This action is **FINAL**.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 21-51 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 21-51 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 12/8/05 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All    b) ☐ Some \*    c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)                        | 4) <input type="checkbox"/> Interview Summary (PTO-413)                     |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)               | Paper No(s)/Mail Date. _____  |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| Paper No(s)/Mail Date <u>10/12/2006</u> .  | 6) <input type="checkbox"/> Other: _____                                    |

## **DETAILED ACTION**

### ***Continued Examination Under 37 CFR 1.114***

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after allowance or after an Office action under *Ex Parte Quayle*, 25 USPQ 74, 453 O.G. 213 (Comm'r Pat. 1935). Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, prosecution in this application has been reopened pursuant to 37 CFR 1.114. Applicant's submission filed on October 12, 2006 has been entered.

### ***Information Disclosure Statement***

2. The information disclosure statement (IDS) submitted on October 12, 2006 has been considered by the examiner.

3. Applicant cited two references as IDS in the remarks section, but the listing of references in the remarks is not a proper information disclosure statement. 37 CFR 1.98(b) requires a list of all patents, publications, or other information submitted for consideration by the Office, and MPEP § 609.04(a) states, "the list may not be incorporated into the remarks but must be submitted in a separate paper." Therefore, unless the examiner on form PTO-892 has cited the references, they have not been considered.

***Response to Amendment***

1. This Office Action is in response to applicant's communication filed October 12, 2006 in response to PTO office action mailed July 24, 2006. The Applicant's remarks and amendments to the claims and/or the specification were considered with the results that follow.
2. Claims 21 and 31 have been amended. Claims 1-20 have been previously canceled. Claims 37-51 have been added. As a result, claims 21-51 remain pending in this application.

***Allowable Subject Matter***

4. The indicated allowability of claims 21-36 is withdrawn in view of the newly discovered reference(s). Rejections based on the newly cited reference(s) follow.

***Claim Objections***

5. Claims 21-30 and 37-51 are objected to because of the following informalities: Claims 21 and 37 recites limitation "the change-over instruction including information identifying a second inner logical volume of the inner logical volumes" is not clear, the appropriate limitation would be, for example, "the change-over instruction including information identifying a second inner logical volume of the inner logical volumes as target volume to be mapped to first upper logical volume".

Claims 22-30 and 38-51 are also objected due to their dependency on the objected claims.

Appropriate correction is required.

***Claim Rejections - 35 USC § 103***

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

4. Claims 21-51 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hirakawa et al. (US 2002/0188768 A1), Mogi et al. (US 2003/0229645 A1) and Guha et al. (US 2004/0054939 A1).

As per claim 21, Hirakawa teaches a storage control device (fig. 2) comprising:  
a channel adapter operatively coupled to a computer (Hirakawa, fig. 2, item 110, and connections 240 connects host computer) provides logical volumes for the computer and to receive data which are sent from the computer to the logical volumes (Hirakawa, par. [0036]);

a memory operatively coupled to the channel adapter to store the data sent from the computer and configuration information with respect to a configuration of the storage control device (Hirakawa, fig. 2, items, 130, 140, pars. [0038] – [0041]);

a disk adapter operatively coupled to the channel adapter and memory, to control reading and writing of the data from/to the memory and used as storage regions for

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transmission and reception of the data between the channel adapter and the disk adapter (Hirakawa, fig. 2, item 120, par. [0037]);

a plurality of disk drives, operatively coupled to the disk adapter, in which data sent from the computer are written by the control of the disk adapter as a data group (Hirakawa, fig. 2, item 150).

Hirakawa fails to teach multiple layers of logical volumes, such as one or more upper logical volume of the plurality of upper logical volumes are mapped to plurality of inner logical volumes provided by disk devices. Mogi teaches hierarchical multiple upper volumes (Mogi, fig. 2, item 204, 206) and multiple inner logical volumes (Mogi, fig. 2, item 208) and upper logical volumes are mapped to inner logical volumes.

It would have been obvious to one having ordinary skill in the art at the time of the invention to use hierarchical volumes as taught by Mogi in the system of Hirakawa to allow transparent and dynamic storage allocation and isolate the internal structure of a logical volume from the logical volume perceived by a host (Mogi, pars. [0008] – [0010]).

Wherein a first inner logical volume of the inner logical volumes is mapped to a first upper logical volume of the upper logical volumes and is mapped to a first set of disk drives in the plurality of disk drives (Mogi, fig. 2), a first data group targeted to the first inner logical volume being written into the first set of disk drives (It is inherent in the system of Mogi, when data is read/written from the logical volume, the subsequent data is read/written to set of disk drives that are mapped to the particular logical volume);

Hirakawa and Mogi teach a changeover command to remap the upper logical volume connected to the first inner logical volume to a second inner logical volume (Hirakawa, par. [0051], Mogi, pars. [0010], [0012] and [0015]). It is inherent in the system of Hirakawa and Mogi that after the execution of remapping command the upper logical volume is disconnected from the first inner logical volume and connected to second inner logical volume (Mogi, fig. 7).

Hirakawa and Mogi fail to teach starting of second set of disk devices and second upper volume to store changeover instruction. Guha teaches starting and stopping the disk devices (Guha, pars. [0065] and [0133] – [0136]). Guha also teaches that the configuration information regarding I/O operations and disk drive operational transitions (i.e. powering up or down etc.) are kept as metadata volume (second upper volume to store change-over instruction). So, in order to access or to power up other volume group and to power down the current volume group (which will not be used), one have to access the configuration information from/to the metadata volumes, which inherently teaches utilizing second upper logical volume for control to change volume mapping as well to power up and power down respective disk drive groups.

It would have been obvious to one having ordinary skill in the art at the time of the invention to use method of starting/stopping disk drives and metadata volume as control volume as taught by Guha in the system of Hirakawa and Mogi to improve the system reliability by decreasing disk failure rate (Guha, pars. [0020], [0027]) and improve the system performance by using metadata volume because a separate metadata volume provides rapid search of system configuration (Guha, par. [0157]).

As per claim 22, Guha teaches that the disk drive group, which was previously accessed by the host, is powered down (stopped) after mapping change to access a new volume group (Guha, pars. [0133]-[0136], taught as single disk drives, but as mentioned in fig. 1 and in par. [0133], a container can be a single disk or multiple disk volumes).

As per claims 23, 24, and 25, Guha teaches that the disk drive group not used, is powered down (Guha, abstract, fig. 1, and pars. [0065] and [0133]-[0136]) and Guha maintains all virtual to physical volume mapping information and disk operational activities (powering on and off) as a metadata volume (pars. [0114] and [0149]). Mogi teaches that inner logical volume can map to multiple upper logical volume (Mogi, fig. 2) thus, it is inherent in the system of Guha and Mogi that there can be multiple disk drive groups are stopped or running (powered off or based on usage) and also one group of drives are mapped to multiple upper volumes so it is necessary to check after and before mapping change whether newly mapped disk drive sets are being used by the some other upper volume and if so the newly mapped drives are running and there is no need to start those disk drives and also to check if previously mapped disk drives are mapped to another upper logical volume or not in order to stop the drives if they are not used by other volume. Thus it would have been obvious to one having ordinary skill in the art at the time of the invention to access the metadata volume information to determine whether the volume group is being used or not used, and after the



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determination, if it is judged that mapping to new volume group was accessed by other upper logical volume then the disk spindles are kept spinning and if newly mapped inner volume was not used than the disk drives mapped to that volume were stopped and there is need to start those disk drives and if there is no existing mapping relation between previously mapped disks than, those disk drives were not in use and hence must be stopped.

As per claim 26, Guha teaches a storage system with virtual volumes and all the mapping information related to I/O operation and disk operations (on/off) is kept as metadata (paragraph [0114]). Guha inherently teaches that all the metadata information has to be updated (related to powering on and off the disk drives as well as volume mapping changes) and thus to update the metadata volume regarding powering on newly mapped drive and powering down previously mapped drive inherently teaches write command (updating of metadata volume information as one volume group is powered down and other volume group is powered up) as a indication of change-over.

As per claims 27 and 29, Guha teaches that one volume group is (written to or read from) is powered on and the other volume group is (not being used after volume change) is powered off (see abstract). It is inherent that the system distinguishes between the command sent from host as reading data from volume groups or reading configuration information from metadata volume in order to change mapping relation to access different volume group than currently mapped volume group to host.

As per claim 28, Guha teaches selectively powering on disk volume group, which is being used and powering down disk volume group, which is not used as explained in claim 1, above which inherently teaches power control device to control power supplied to disk spindles.

As per limitations of claim 30, it is apparent that storage devices are used for plurality of applications, such as backup, restore, archive etc (see present application specification, background of invention) and depending upon the application of storage device the inner logical volumes can contain same group of data or different group of data.

Claims 31-51 are also rejected under the same rationales as applied to the claims 21-30 above.

### ***Conclusion***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Kaushikkumar Patel whose telephone number is 571-272-5536. The examiner can normally be reached on 8.00 am - 4.30 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Hyung Sough can be reached on 571-272-6799. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.


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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



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12/26/06